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(54) Star point connector for an electric motor armature

(57) An armature for an electric motor comprises a lamination stack (11) forming three pole pieces (13), winding coils (14) on respective pole pieces, and an electrically conductive ring (15) to which respective one ends (14') of the winding coils are connected to form a star point. The ring is fixed to one end of the stack by integral finger portions (16) which extend through tunnels (17) formed by adjacent pole pieces and grip the opposite end of the stack. Connection may be by insulation piercing slots 18 or by soldering and optional winding anchoring tabs may be provided. Cooling fan blades 21 may be formed on the ring.

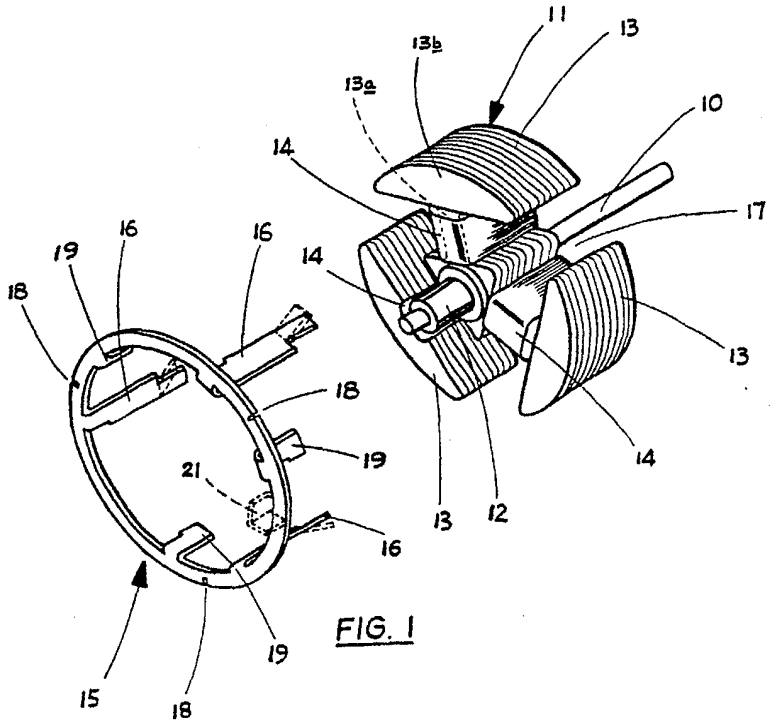

FIG. 1

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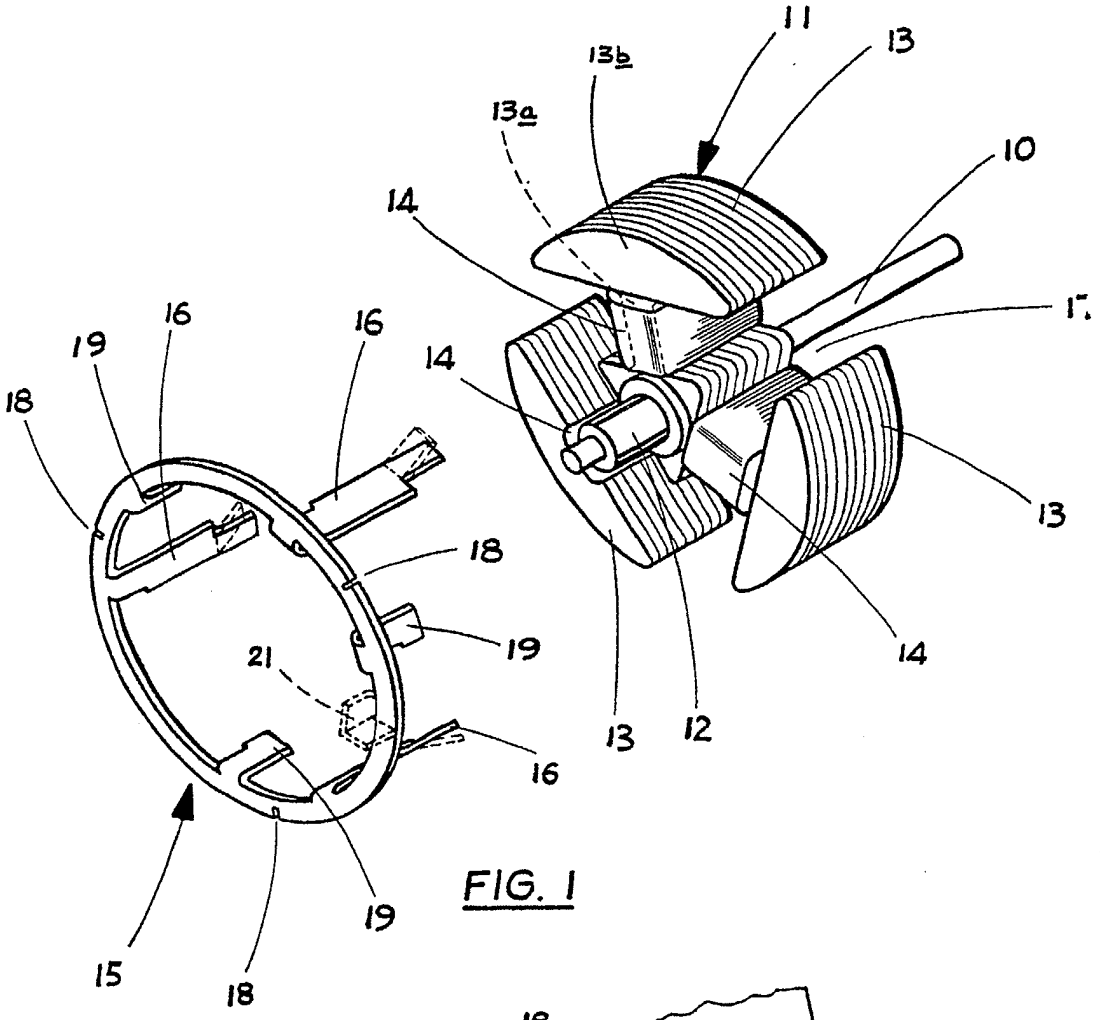

FIG. 1

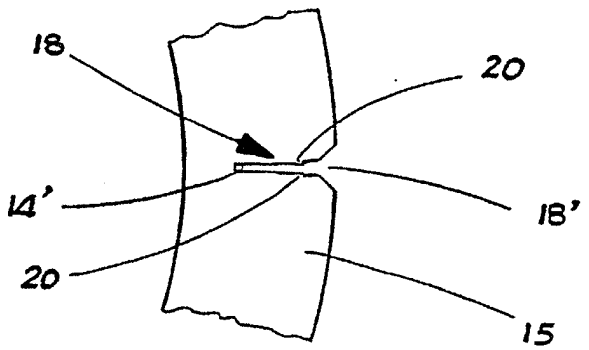

FIG. 2

An armature for an electric motor

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This invention relates to an armature for an electric motor, particularly for a fractional horsepower permanent magnet direct current motor, and a motor having such an armature.

Winding three pole lamination stacks for relatively low speed high voltage armature windings becomes difficult in that a very large number of turns of a small gauge of winding wire has to be used and it is difficult to connect this winding wire to a commutator. This is particularly so if a delta connected winding is used.

It is known to use a star connected system instead which reduces the number of turns required per coil to about 66% and thereby increases the gauge.

This makes winding faster and connecting to the commutator more reliable. However the problem of connecting the three coil ends one to another becomes a new problem. It is possible to simply pleat them together, solder them and secure them with an adhesive somewhere in a lamination tunnel. It is

also possible to mount a connecting ring on an insulating brush provided on the motor shaft at the end of the armature distal from the commutator and connect the ends to the ring. However, neither of these solutions is satisfactory. The first upsets the balance of the armature and the star point can loosen and fly out. The second increases the overall length of the motor which is usually undesirable.

According to the present invention there is provided an armature for an electric motor, comprising a lamination stack having pole pieces, windings on the pole pieces, and an electrically conductive ring on one end of the stack adjacent to the outer periphery thereof, one end of each winding being electrically connected to the ring.

Preferably, the ring is fixed to said one end of the stack by finger portions which are integral with the ring and which extend through tunnels between the pole pieces and grip the other end of the stack.

Conveniently, the ring is mounted on an end of the stack adjacent to a commutator.

The windings may be soldered to the ring or held in slots which displace insulation from the windings as they are drawn into the slots.

The ring may have vanes which will create a fan action when the armature is rotated in a motor frame.

The invention will now be more particularly described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is an exploded perspective view of an armature embodying the invention; and

Figure 2 is a fragmentary plan view of a ring of the armature of Figure 1, on an enlarged scale.

Referring to the drawings, the armature shown therein is for a fractional horsepower p.m.d.c. motor and comprises a shaft 10 and a lamination stack 11 and a commutator 12 mounted fast on the shaft 10.

The lamination stack 11 has three mushroom shaped pole pieces 13 (comprising a radially extending arm 13a and a head 13b) and a winding coil 14 on each

pole piece. One end of each winding coil 14 is connected to a respective commutator bar of the commutator 12 in a manner generally known in the art. The other end 14' (see Figure 2) of each winding coil 14 is connected to an electrically conductive ring 15 fixed to an end of the lamination stack 11 adjacent to the outer periphery of the stack 11. Preferably the ring 15 is connected to the end of the stack 11 adjacent to the commutator 12 but the ring could be fixed to the end of the stack 11 distal from the commutator 12.

The ring 15 is preferably of a non-magnetic metal, e.g. aluminium and is stamped from metal sheet. The ring 15 is fixed to the stack 11 by three integral finger portions 16 which are bent out of the plane of the ring. The finger portions 16 extend through tunnels 17 between the pole pieces 13 and are caused to grip the end of the stack 11 remote from the commutator 12 by outwardly deforming the free ends of the finger portions 16, as shown by the dotted lines in Figure 1.

The finger portions 16 are disposed, respectively, on one side of each arm 13a. The ring 15 also has three shorter finger portions 19 which are disposed on the

other side of each arm 13a to locate the ring 15 against angular movement relative to the stack 11.

The winding coils 14 could be soldered to the ring 15 but as shown in Figure 2 the said other ends 14' of the winding coils 14 are located in slots 18 in the ring 15. The slots 18 extend radially inwards from the outer edge of the ring 15 and have a width which is less than the diameter of the conducting core of the winding coils 14. Each slot 18 also has two cutting edges adjacent to the mouth or open end 18' of the slot for cutting through the insulation on the winding coil 14 as it is drawn into the slot so as to establish electrical contact between the ring 15 and the winding coil 14. As the winding coil 14 is drawn further into the slot 18 the slot straddles and grips the core of the winding coil 14 to maintain said electrical contact.

If desired the winding coils 14 can be further anchored to the ring 15 such as by winding the end of the winding coils around tabs (not shown) formed integrally with the ring.

Moreover, if desired vanes can be stamped integrally with the ring to form a fan, one such vane being illustrated in broken lines in Figure 1 and denoted by reference numeral 21.

The ring 15 serves as a star point for the winding coils 14. The ring 15 does not encroach upon valuable space and does not disturb the motor balance.

The armature is mounted in a motor frame (not shown) which may conventionially comprise a drawn can-like casing having an integral plate at one end which supports one motor bearing and an end cap or cover at the other end supporting the other motor bearing and motor brush gear.

The above embodiment is given by way of example only and various modifications will be apparent to persons skilled in the art without departing from the scope of the invention defined by the appended claims.

Claims

1. An armature for an electric motor, comprising a lamination stack having pole pieces, windings on the pole pieces, and an electrically conductive ring on one end of the stack adjacent to the outer periphery thereof, one end of each winding being electrically connected to the ring.

2. An armature as claimed in claim 1, wherein the ring is fixed to said one end of the stack by finger portions which are integral with the ring and which extend through tunnels between the pole pieces and grip the other end of the stack.

3. An armature as claimed in claim 1 or claim 2, wherein the ring has vanes.

4. An armature as claimed in any one of claims 1 to 3, wherein the lamination stack is mounted on a shaft and a commutator is provided on the shaft, the other end of each winding being connected to the commutator.

5. An armature as claimed in claim 4, wherein the commutator is mounted on the shaft at said one end of the stack.

6. An armature as claimed in any one of the preceding claims, wherein the windings are soldered to the ring.

7. An armature as claimed in any one of claims 1 to 5, wherein the ring has slots for straddling and gripping said one ends of the windings, respectively.

8. An armature as claimed in claim 7, wherein each slot has an open end for receiving said one end of a winding and two cutting edges for cutting through insulation of the winding as it is drawn into the slot to establish electrical contact between the winding and the ring.

9. An armature for an electric motor, substantially as hereinbefore described with reference to the accompanying drawings.

10. An electric motor having an armature according to any one of the preceding claims.

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